

WHAT IS CLAIMED IS:

1. A method of operating a memory circuit, comprising the steps of:
activating a precharge signal applied to a precharge circuit to precharge a bitline to a
5 predetermined voltage;
activating a first control signal from an inactive state while the precharge signal is active,
the first control signal applied to a control terminal of a memory cell transistor, the memory cell
transistor having a current path connected to the bitline; and
inactivating the precharge signal while the first control signal is active.
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2. A method as in claim 1, wherein the memory cell comprises Lead Zirconate Titanate (PZT).
3. A method as in claim 1, wherein the memory cell comprises Strontium Bismuth Titanate
(SBT).
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4. A method as in claim 1, comprising the step of inactivating the first control signal while the
precharge signal is active.
5. A method as in claim 1, comprising the step of activating from an inactive state a second
20 control signal applied to the memory cell after the step of inactivating the precharge signal.
6. A method as in claim 5, comprising the steps of:
inactivating the second control signal while the first control signal is active; and
activating the precharge signal while the first control signal is active and the second control
25 signal is inactive.
7. A method as in claim 6, wherein the first control signal is a wordline signal, and wherein
the second control signal is a plateline signal.

8. A method as in claim 7, wherein the wordline signal is applied to a first wordline and not applied to a second wordline, and wherein the plateline signal is applied to memory cells connected to the first and the second wordline.
- 5 9. A method as in claim 1, wherein the step of activating a precharge signal precharges the bitline and a complementary bitline to the predetermined voltage.
10. A method as in claim 9, wherein the predetermined voltage is V_{ss} .
- 10 11. A memory circuit, comprising:
a bitline;
a voltage terminal;
an access transistor connected to the bitline, the transistor having a first control terminal coupled to receive a first control signal arranged to turn the access transistor on; and
15 a first precharge transistor having a current path coupled between the bitline and the voltage terminal, the first precharge transistor having a gate coupled to receive a precharge signal, wherein the precharge signal turns the first precharge transistor off and on while the access transistor is on.
- 20 12. A memory circuit as in claim 11, wherein the memory circuit is a ferroelectric memory circuit.
13. A memory circuit as in claim 11, wherein the first control terminal is a wordline terminal.
- 25 14. A memory circuit as in claim 11, comprising:
a second control terminal coupled to receive a second control signal; and
a ferroelectric capacitor coupled between the access transistor and the second control terminal.
- 30 15. A memory circuit as in claim 14, wherein the second control signal produces a voltage on the bitline after the precharge signal turns off the first precharge transistor.

16. A memory circuit as in claim 14, comprising:

a complementary bitline;

a second precharge transistor having a current path coupled between the complementary

5 bitline and the voltage terminal, the second precharge transistor having a gate coupled to receive the precharge signal.

17. A memory circuit as in claim 16, comprising a third precharge transistor having a current path coupled between the bitline and the complementary bitline, the third precharge transistor

10 having a gate coupled to receive the precharge signal.

18. A memory circuit, comprising:

a memory array arranged in rows and columns of memory cells, each row of memory cells connected to a respective wordline, each column of memory cells connected to one of a bitline and

15 a complementary bitline, wherein an active wordline accesses a respective row of memory cells;

a plurality of precharge circuits, each precharge circuit connected to a respective column of memory cells and coupled to receive a precharge signal, wherein an active precharge signal renders a respective precharge circuit conductive; and

20 a control circuit arranged to produce an active wordline signal from an inactive wordline signal while the precharge signal is active.

19. A memory circuit as in claim 18, wherein the memory cells are ferroelectric memory cells.

20. A memory circuit as in claim 18, comprising a plurality of plateline terminals, each plateline
25 terminal corresponding to a respective plurality of rows of memory cells.

21. A memory circuit as in claim 20, wherein a control signal applied to a plateline terminal produces a voltage on one of a bitline and a complementary bitline after the precharge signal turns off the respective precharge circuit.

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22. A memory circuit as in claim 18, wherein each precharge circuit comprises:
a first transistor connected between a respective bitline and a voltage terminal;
a second transistor connected between a respective complementary bitline and the voltage
terminal.

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23. A memory circuit as in claim 22, wherein each precharge circuit comprises a third transistor
connected between the respective bitline and the respective complementary bitline.

24. A memory circuit as in claim 22, wherein each column of memory cells is coupled to a
10 respective sense amplifier, each sense amplifier arranged to amplify a difference voltage between
one of a bitline or complementary bitline voltage and a reference voltage.

25. A memory circuit as in claim 24, wherein the reference voltage is applied to the other of the
bitline or complementary bitline.

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26. A memory circuit, comprising:
a bitline;
a complementary bitline;
a voltage terminal;

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a first access transistor connected to the bitline, the first access transistor having a first
control terminal coupled to receive a first control signal arranged to turn the access transistor on;
a second access transistor connected to the complementary bitline, the second access
transistor having a second control terminal coupled to receive the first control signal arranged to
turn the second access transistor on;

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a first precharge transistor having a current path coupled between the bitline and the voltage
terminal, the first precharge transistor having a gate coupled to receive a precharge signal, wherein
the precharge signal turns the first precharge transistor off and on while the first access transistor is
on; and

a second precharge transistor having a current path coupled between the complementary bitline and the voltage terminal, the second precharge transistor having a gate coupled to receive the precharge signal.

5 27. A memory circuit as in claim 26, wherein the memory circuit is a ferroelectric memory circuit.

28. A memory circuit as in claim 26, wherein each of the first and second control terminals is a wordline terminal.

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29. A memory circuit as in claim 26, comprising:
a third control terminal coupled to receive a second control signal; and
a first ferroelectric capacitor coupled between the first access transistor and the third control terminal; and

15 a second ferroelectric capacitor coupled between the second access transistor and the third control terminal.

30. A memory circuit as in claim 29, wherein the second control signal produces a voltage on the bitline and the complementary bitline after the precharge signal turns off the first and second precharge transistors.

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31. A memory circuit as in claim 26, comprising a third precharge transistor having a current path coupled between the bitline and the complementary bitline, the third precharge transistor having a gate coupled to receive the precharge signal.

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32. A memory circuit, comprising:
a bitline;
a voltage terminal;
an access transistor connected to the bitline, the transistor having a first control terminal

30 coupled to receive a first control signal arranged to turn the access transistor on; and

a first precharge transistor having a current path coupled between the bitline and the voltage terminal, the first precharge transistor having a gate coupled to receive a precharge signal, wherein the precharge signal turns the first precharge transistor off from an on state while the access transistor is on.

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33. A memory circuit as in claim 32, wherein the memory circuit is a ferroelectric memory circuit.

34. A memory circuit as in claim 32, wherein the first control terminal is a wordline terminal.

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35. A memory circuit as in claim 32, comprising:
a second control terminal coupled to receive a second control signal; and
a ferroelectric capacitor coupled between the access transistor and the second control terminal.

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36. A memory circuit as in claim 35, wherein the second control signal produces a voltage on the bitline after the precharge signal turns off the first precharge transistor.

37. A memory circuit as in claim 35, comprising:

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a complementary bitline;
a second precharge transistor having a current path coupled between the complementary bitline and the voltage terminal, the second precharge transistor having a gate coupled to receive the precharge signal.

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38. A memory circuit as in claim 37, comprising a third precharge transistor having a current path coupled between the bitline and the complementary bitline, the third precharge transistor having a gate coupled to receive the precharge signal.

39. A method of operating a memory circuit for a memory cycle, comprising the steps of:

activating a precharge signal applied to a precharge circuit to precharge a bitline to a predetermined voltage;

activating a first control signal while the precharge signal is active, the first control signal applied to a control terminal of a memory cell transistor, the memory cell transistor having a current
5 path connected to the bitline;

applying an inactive second control signal to the memory cell;

then inactivating the precharge signal; and

then activating the second control signal.

10 40. A method as in claim 39, comprising the step of inactivating the first control signal while the precharge signal is active.

41. A method as in claim 39, comprising the steps of:

inactivating the second control signal while the first control signal is active; and

15 activating the precharge signal while the first control signal is active and the second control signal is inactive.

42. A method as in claim 41, wherein the first control signal is a wordline signal, and wherein the second control signal is a plateline signal.

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43. A method as in claim 42, wherein the wordline signal is applied to a first wordline and not applied to a second wordline, and wherein the plateline signal is applied to memory cells connected to the first and the second wordline.

25 44. A method as in claim 39, wherein the step of activating a precharge signal precharges the bitline and a complementary bitline to the predetermined voltage.

45. A method as in claim 44, wherein the predetermined voltage is V_{ss} .